

REMARKS

This amendment is responsive to the Office Action of September 12, 2008. Reconsideration and allowance of the claims 19-41 are requested.

The Office Action

Claims 1-3, 6-8, 14-18, 21-23, 29, and 30 stand rejected under 35 U.S.C. § 102 as being anticipated by Wyman (US 7,106,891).

Claims 4, 5, 19, and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Wyman.

Claims 9-13 and 24-28 stand rejected under 35 U.S.C. § 103 as being unpatentable over Wyman in view of Betke ("Automatic 3D Registration of Lung Surfaces in Computed Tomography Scans").

It is unclear how claim 29 can be anticipated by Wyman. A dependent claim is read as including all of the subject matter of its parent claims, and claim 29 depends from claims 24-26 which were rejected under 35 U.S.C. § 103 over the combination of Wyman and Betke.

The Specification

The applicant thanks the Examiner for outlining the recommended arrangement of the specification. First, the applicant would like to point out that this arrangement is recommended and not required. Second, the applicant would like to note that the present application was filed with headings in accordance with the recommended arrangement of the specification.

Background Discussion

Registering non-rigid organs, such as the lungs, has proven to be a very difficult task. As Betke points out on page 2, paragraphs 1-4, alignment techniques have been developed for rigid organs, particularly the head and bones, in which the skull rigidly constrains the shape of two images of the same subject. While many have proposed transforms which may be successful for such rigid organs, a successful transform for non-rigid organs has proven elusive.

Non-rigid organs, such as the lungs, can vary significantly from one image of the patient to another. The lungs may not be inflated to the same degree, the patient may be positioned differently; depending on the geometry of the scan, the effective magnification may be different; and the like. Moreover, other adjacent organs, such as the beating heart, can cause portions of the non-rigid organ to be deformed to different degrees in each image. These and other problems make aligning head scans with the rigid skull a much simpler registration problem.

Claim 23 is Not Anticipated by Wyman

Claim 23 has been placed in independent form including all of the subject matter of its parent claims 16, 17, and 18.

Claim 23 calls for reducing the number of points with an oversampling of points for optimizing registration along a direction in which the slice pairs are stepped. When imaging lungs, it is common to step along the long axis of the lung. When comparing the common slices, it is important that the corresponding slices truly correspond. If the supposedly corresponding slices do not correspond, errors in the analysis can arise. Some nodules may seem to have disappeared and other nodules may appear to have sprung up. On the other hand, if there is distortion within the corresponding slices, for example one may be more elongated in the left or right direction and the other might be more elongated in the up and down direction, the diagnostician can readily compensate for the slight shifts in the position of the nodules. The diagnostician can very readily determine the corresponding nodules and compare them for growth or shrinkage.

When doing a matching of points, there can be hundreds of thousands of points to be matched, which can be computationally burdensome. Claim 23 calls for reducing this number of points to reduce the computational burden, but making the reduction in such a manner that registration in the stepping direction is optimized relative to the other directions. Wyman fails to recognize this problem, much less suggest the solution set forth in claim 23. Indeed, because Wyman is registering a rigid organ, particularly the brain constrained by the rigid skull, Wyman does not have to deal with the problem that a non-rigid organ might be deformed in different ways in different directions in different images.

Accordingly, it is submitted that claim 23 and claims 19, 20, and 31-35 dependent therefrom are not anticipated by Wyman.

Claim 24 Distinguishes Patentably Over Wyman and Betke

Claim 24 has been placed in independent form and further amended to emphasize its distinctions over Wyman and Betke.

Claim 24 calls for converting a portion of each of the diagnostic images which corresponds to a common non-rigid organ into a feature image representation indicative of boundaries of the non-rigid organ in each of the first and second diagnostic images. The transform representative of the misalignment of these feature image representations or boundaries of the common organ is then determined. The diagnostic images are then operated upon in order to register the common non-rigid organ in the first and second diagnostic images.

Wyman does not disclose and makes no suggestion that one should determine the boundary of a non-rigid organ. Betke fails to cure this shortcoming of Wyman.

Accordingly, it is submitted that claim 24 and claims 21, 22, 25-29, 36, and 37 dependent therefrom distinguish patentably and unobviously over the references of record.

**Claims 38-41 Distinguish Patentably
Over the References of Record**

New claim 38 includes concepts from claims 23 and 24 discussed above and the claims dependent therefrom. Accordingly, it is submitted that claim 38 and claims 39-41 dependent therefrom distinguish patentably over the references of record.

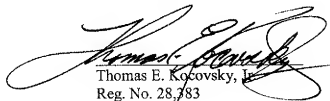
CONCLUSION

For the reasons set forth above, it is submitted that claims 19-41 are not anticipated by and distinguish patentably over the references of record. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, the Examiner is requested to telephone Thomas Kocovsky at (216) 363-9000.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Thomas E. Kocovsky, Jr.", is written over the printed name and address.

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